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ABSTRACT

Data are from a large scale experimental study which was designed to evaluate a multimethod problem solving approach to obesity. Obese adult volunteers (N=90) were randomly assigned to three groups: maximal treatment, minimal treatment, and no treatment control. In the two treatment groups, subjects were exposed to bibliographic material and therapeutic sessions. During the first six months of treatment, maximal subjects were seen weekly whereas minimal subjects were seen once every three weeks. In addition to height and weight, experimental subjects were assessed on the following factors: somatotype, serum lipids, blood pressure, exercise stress (EKG), pulmonary function, densitometric body fat, skinfold estimated body fat, ultrasonic estimation of body fat, orthostasis, cellular biopsy (to assess adipocyte size and number), girth measurements, daily activity level (via pedometer), daily energy intake (via self-recording), familial history, nutrition knowledge, exercise knowledge, weight loss attitudes and attributions, plus a variety of psychometric scales which range from depression and marital adjustments to personality profiles and the restraint scale. These numerous factors were measures in an attempt to identify predictor variables which correlate with differential responsiveness to treatment. The overall findings from the study are presented, along with some implications for further research and treatment. (Author)

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Results and Implications of a Problem-Solving Treatment Program for Obesity

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Results and Implications of a Problem-Solving Treatment Program for Obesity

In 1926, a British physician named Williams offered this observation: "There is no fool so foolish but is an expert on obesity." Certainly his statement is relevant to those of us who work in treatment. At times it seems to me that our ignorance is surpassed by only one thing--and that is our persistence.

In 1967, as most of us are well aware, it appeared that our persistence had finally been rewarded. Against the quote "pessimistic backdrop" of traditional treatment outcome, we "hailed" the advent of the behavioral treatment of obesity as "revolutionary"; we considered it a "landmark" in the field. If Dr. Stunkard has made no other contribution, which is clearly not the case, he deserves credit for having given us a classic statement about traditional treatment failure, a graphic vocabulary for describing our behavioral success--and a standard introduction to our papers for the past 10 years.

Recently, however, our introductions have changed. We have begun to describe behvioral procedures as more effective rather than very effective, our typical weight loss as modest rather than impressive, and our outcomes as variable rather than consistent. A decade later, we are beginning to take a second look. Predictably, along with therapeutic promise, we are seeing paradigmatic problems. In fact, the questions which have been stimulated by the behavioral treatment of obesity appear to be more

compelling--and potentially more informative--than the answers it has provided thus far. Among many questions generated by our recent "answers," the issues of behavioral treatment efficacy, the role of therapist contact, and the delineation of predictor variables clearly emerge as salient. Interest in these questions and in the refinement of our assessment skills prompted us to design and implement an experimental project with the following purposes:

1) to evaluate the efficacy of an extension and variation of the standard behavioral treatment package--specifically a problem-solving approach;
2) to evaluate the role of therapist contact in the administration of such a treatment package;
3) to evaluate and refine our assessment skills; and
4) to identify predictor variables--variables which might predict differential responsiveness to treatment.

METHODS

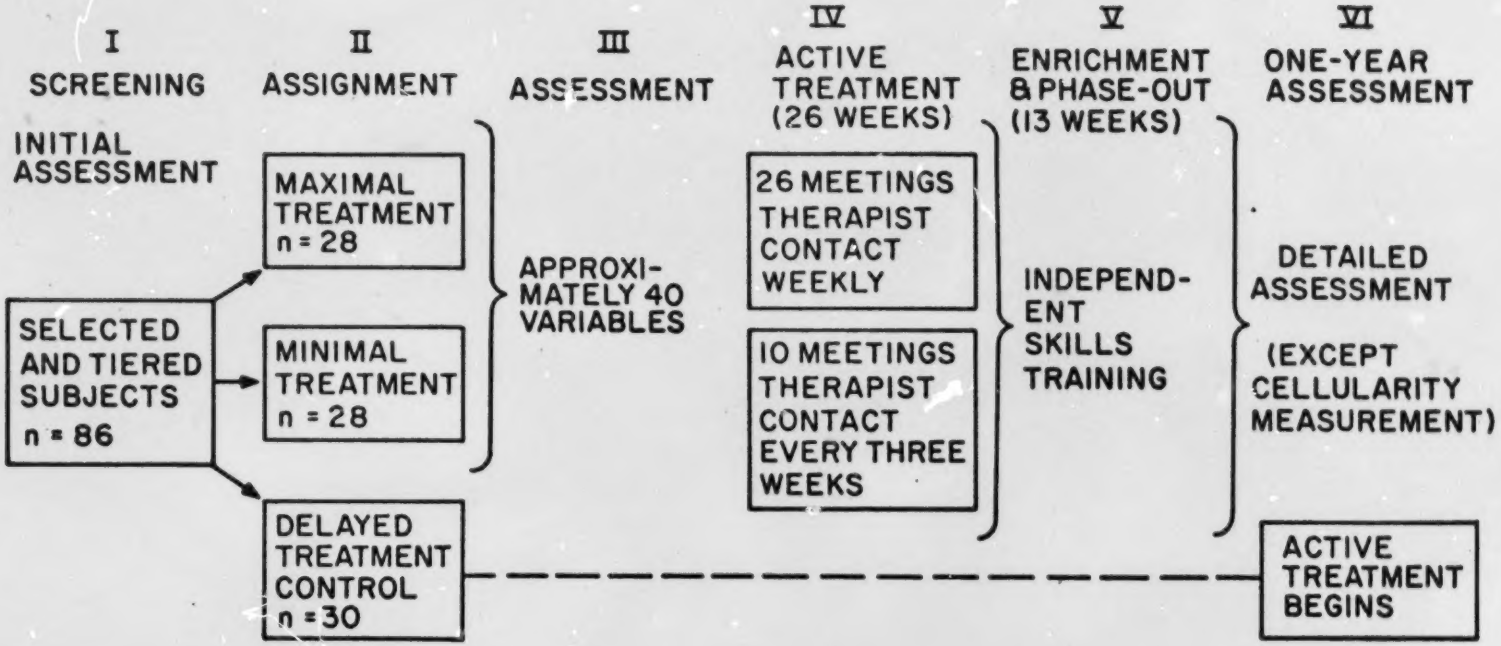
A general description of our experimental design is presented in Table 1.

Insert Table 1 here

Eighty-six volunteer subjects who met our initial eligibility requirements (25% fat in males and 35% in females) were tiered on the basis of percent fat and randomly assigned to three groups: maximal contact, minimal contact, and delayed treatment control. The major differences in the maximal and minimal treatment groups were the amount of therapist contact and the consequently greater degree of independent functioning required of minimal contact subjects.

Table 1

EXPERIMENTAL DESIGN



Assessment

The extensiveness of our assessment procedures and time constraints necessitate my concentrating on our general purposes in conducting such thorough assessment rather than on descriptive details. In terms of comparison between groups, it is important to state that body weight, percent body fat by skinfold calipering, wrist girth, and several psychological measures were obtained on all subjects pre and post. In addition, we assessed treatment subjects on approximately 30 other variables.

Our general rationale for such comprehensive assessment was three-fold:

1) First, our view of obesity as a complex disorder of a variety of origins--and our consequent emphasis on individualization within the treatment package. To the extent that experimental considerations were not violated, subjects were given feedback on assessment variables to increase their understanding of their individual weight problems and to facilitate individualized application of treatment strategies. For example, each subject was informed of his percent body fat. Taking personal weight history and other factors into account, this information was then utilized in setting realistic percent fat target goals for each participant.

2) Second, our goal of refining assessment skills. Given the serious concerns raised by body composition specialists about the definition of obesity solely as a function of body weight, we were interested in exploring the possibility that more accurate measures of obesity,

namely--percent body fat, might be employed with a minimum of additional expertise or equipment.

3) Third, our focus on the delineation of predictor variables. We were interested in collecting as much physiological and psychological data as possible in order to facilitate our search for potential predictors of treatment outcome.

Assessment variables fell into three general categories. First, physiological factors, which are illustrated in Table 2. For the reasons just

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Insert Table 2 here

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described, and because of our programmatic emphasis on improved health and physical fitness, we assessed all treatment subjects on these physiological variables. Wherever methodologically appropriate and pragmatically plausible, these measures were taken pre and post. Especially relevant are the four methods employed to assess percent fat: skinfold calipering and hydrostatic, ultrasonic, and radiographic densitometry. The utilization of these procedures allowed us to assess the validity of our body fat analysis via calipering through comparison with these more elaborate techniques. Blood pressure, hematological factors, pulmonary function, and exercise stress testing were evaluated particularly because of their relationship to cardiovascular health; and finally, measures of adipose cell size and number were assessed primarily because of their potential predictive power.

Assessment as demonstrated in Table 3, consisted of evaluation of

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Insert Table 3 here

Table 2

ASSESSMENT VARIABLES

PHYSIOLOGICAL

AGE
SEX
HEIGHT
WEIGHT
WEIGHT HISTORY (CHRONICITY)
AGE OF OBESITY ONSET
HEREDITY SCORE
SKINFOLD CALIPERING (% FAT)
HYDROSTATIC DENSITOMETRY (% FAT)
ULTRASOUND DENSITOMETRY
RADIOGRAPHIC DENSITOMETRY
ANTHROPOMETRIC MEASUREMENTS
BLOOD PRESSURE / PRESSURE PULSE

HEMATOLOGICAL ANALYSES:
- SERUM LIPIDS
- INSULIN
- GLUCOSE
- T3 / T4
- ENZYMES
- CORTISOL

PULMONARY FUNCTION
EXERCISE STRESS TESTING
ADIPOSE CELLULARITY MEASURES:
- CELL NUMBER
- CELL SIZE

ADIPOSE ENZYME ANALYSIS

Table 3

ASSESSMENT VARIABLES

PSYCHOLOGICAL

MASTER QUESTIONNAIRE:

- COGNITIVE FACTORS
- ENERGY BALANCE KNOWLEDGE

BECK DEPRESSION INVENTORY

TAYLOR MANIFEST ANXIETY SCALE

MARITAL ADJUSTMENT TEST

RESTRAINT QUESTIONNAIRE

COMPREHENSION TESTS

OTHER

CALORIE INTAKE

ACTIVITY LEVEL (MILES/DAY BY PEDOMETER)

ENERGY BALANCE HABITS

SOCIAL SUPPORT SCORE

COMPOSITE SUCCESS RATINGS

PREFERRED TECHNIQUE RANKINGS

SELF-REPORT OF PATTERN CHANGE

cognitive factors and energy balance knowledge by a questionnaire which we developed, and the administration of the Beck Depression Inventory, the Taylor Manifest Anxiety Scale, the Marital Adjustment Test, and the Restraint Questionnaire--all pre and post. Subjects' comprehension of the content of each treatment unit was also assessed during each unit, and in sum at the end of active treatment.

Several other relevant variables were also evaluated. For example, energy balance habits were assessed by questionnaire and also by subjects recording. To avoid the type of inference recently indicted, to provide a check on actual behavioral changes in energy balance habits, caloric intake was recorded for a specified period pre and post treatment. In addition activity level was measured by digital pedometers, yielding pre and post estimates of subjects' activity in miles covered per day. Finally, subjects' perceptions of their social support systems were evaluated pre and post via questionnaire.

Treatment

Following initial assessment, we exposed subjects to a comprehensive treatment program, consisting of a number of components that have been empirically delineated as potent interventions for weight control. During the six-month active treatment interval--using Mahoney and Mahoney's (1976) Permanent Weight Control as the treatment manual--three therapists guided subjects through a sequence of treatment units.

As indicated in Tables 4 and 5, subjects were first taught to become

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Insert Tables 4 and 5 here

"personal scientists." That is, they were taught a general problem-solving

Table 4

ACTIVE TREATMENT INGREDIENTS

UNIT I: INTRODUCTION AND BASIC INFORMATION. FOCI OF PROGRAM: CHANGING PATTERNS VERSUS WEIGHT LOSS PER SE AND EMPHASIS ON LONG-TERM BEHAVIOR CHANGE.

UNIT II: PERSONAL SCIENCE PROBLEM-SOLVING MODEL. A SET OF PROBLEM-SOLVING PRINCIPLES WERE TAUGHT WHICH WERE THEN INDIVIDUALLY APPLIED TO THE AREAS COVERED IN UNITS 3 THROUGH 8.

UNIT III: COGNITIVE RESTRUCTURING. TRAINING IN RECORDING, EVALUATION AND ALTERATION OF WEIGHT-RELEVANT PRIVATE MONOLOGUES. EMPHASIS ON REALISTIC GOAL SETTING.

UNIT IV: ENVIRONMENT ENGINEERING. INSTRUCTION IN METHODS OF DEVELOPING ADEQUATE SOCIAL SUPPORT FOR CONTINUING REDUCTION EFFORTS.

UNIT V: RESONABLE DIETING. GRADUAL MODIFICATION OF FOOD INTAKE, BOTH CALORICALLY AND NUTRITIONALLY.

Table 5

ACTIVE TREATMENT INGREDIENTS (CONTINUED)

UNIT VI: EATING STYLE. TRAINING IN ANALYSIS AND MODIFICATION OF COGNITIVE, PHYSIOLOGICAL, AND SOCIAL CUES INFLUENCING THE INITIATION AND TERMINATION OF EATING.

UNIT VII: ENERGY EXPENDITURE. INSTRUCTION IN DEVELOPING A MORE ACTIVE LIFE-STYLE.

UNIT VIII: COUNTERACTING EMOTIONAL EATING. TRAINING IN MUSCULAR RELAXATION SKILLS.

UNIT IX: TROUBLESHOOTING AND LONG-TERM MAINTENANCE.

MAHONEY, M.J. & MAHONEY, K. PERMANENT WEIGHT CONTROL: A TOTAL SOLUTION TO THE DIETER'S DILEMMA. NEW YORK: W.W. NORTON & COMPANY, INC, 1976.

model which was then individually applied to several aspects of their weight problems. The individual application of this general model allowed each participant to collect his own personal data on any given weight-relevant topic, to look for his own idiosyncratic patterns, and to generate and test personally relevant options for changes in that area. These principles were then applied to several areas:

1) Cognitive Restructuring: Subjects were taught to record, evaluate, and alter their private monologues; that is, they were encouraged to "clean up" their weight-related self-talk. Emphasis was also placed on realistic goal-setting.
2) Environmental Engineering: Participants received instruction in methods of developing adequate social support systems.
3) Reasonable Dieting: Subjects were discouraged from "going on diets"; rather, they were taught to evaluate and to gradually modify food intake, both calorically and nutritionally.
4) Eating Style: Participants were taught to analyze and modify the cognitive, physiological, and social cues influencing the initiation and termination of eating.
5) Energy Expenditure: Subjects were assisted in developing individualized and reasonable methods for increasing energy expenditure. Emphasis was placed on expanding daily activity patterns rather than initiating strenuous calisthenic exercise.
6) Counteracting Emotional Eating: After an explanation of its relevance for emotional eating, participants were given written

instructions, a demonstration, and homework assignments designed to give them practice in muscular relaxation skills.

During the treatment interval, maximal contact subjects met weekly for a total of 26 sessions. This group met three times per treatment unit--once in a didactic, lecture format session, twice in small group sessions for more individualized input. In contrast, minimal contact subjects met every three weeks for a total of 10 sessions. These meetings followed the three-week self-application of each treatment unit and were essentially utilized to give feedback and discuss revisions of the strategies these subjects had already developed and tried. Because of our interest in permanent behavior change (maintenance), we used a rather slow-moving format, with a very strong emphasis on gradual, comfortable changes. It is salient that we strongly de-emphasized weight loss in favor of positive self-valuation for small behavioral changes throughout the treatment interval.

Active treatment was followed by a 13 seek phase-out, "Independent Skills Trianing" period during which therapeutic contact became less and less frequent.

RESULTS

Since our two year data are not in, I will focus on results at 1 year. First, treatment efficacy. We assessed outcome via changes in body weight and by relative fat change. As described in Table 6, relative fat change

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Insert Table 6 here

Table 6

RELATIVE FAT CHANGE (RELFATCH)

$$\text{RELFATCH} = \frac{\text{FAT LOST}}{\text{EXCESS FAT}} \times 100$$

$$= \frac{\text{PRE \% BODY FAT} - \text{POST \% BODY FAT}}{\text{PRE \% BODY FAT} - \text{IDEAL \% BODY FAT}} \times 100$$

(WHERE IDEAL % BODY FAT = 24% - FEMALES,
14% - MALES)

is a measure which combines the advantage provided by the Weight Reduction Quotient with the advantages of using body fat rather than body weight as the criterion for obesity. It is calculated by dividing "fat lost" by "excess fat" and multiplying by 100--thus yielding the percent excess fat lost by the subject.

What we found was all too familiar--modest mean changes but, as shown in Figures 1 and 2, tremendous variability in both outcome measures. Specifically, mean weight loss in the combined treatment groups was eight pounds,

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Insert Figures 1 and 2 here

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with a range of a gain of seven and one-half pounds to losses up to 40 pound. There was a significant difference between the mean of the combined treatment groups and the mean of the control group on this outcome measure, with control subjects gaining an average of one and one-half pounds.

Variability was also extreme in relative fat change measures with a mean in the combined treatment groups of 8.8 percent and a range of +15 percent (gain) to -58 percent (loss). No significant differences emerged between treatment and control subjects on this measure.

Treatment/control comparisons were somewhat biased by the data of one control subject who lost 30 pounds and 31 percent excess fat, reportedly by her individual pursuit of the programmatic principles outlined by us at the screening session. However, attainment of more impressive and consistent losses may necessitate revisions in the content, more probably, in the format and emphasis of the treatment program which we utilized.

Second, role of therapist contact. Were there significant differences in outcome in the maximal and minimal contact groups? Mean weight loss was eight pounds in each group, clearly not a significant difference. Relative

Figure 1

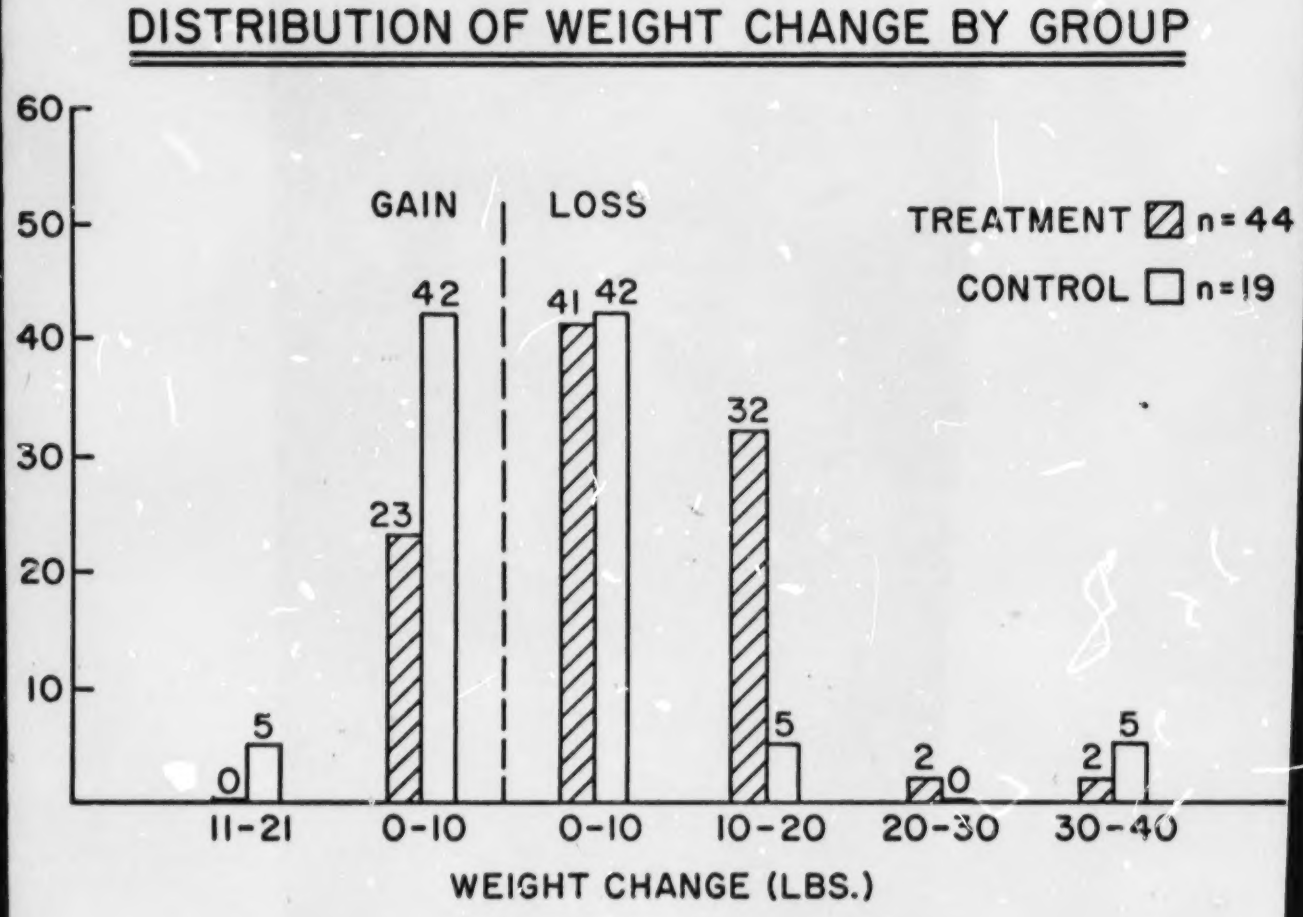
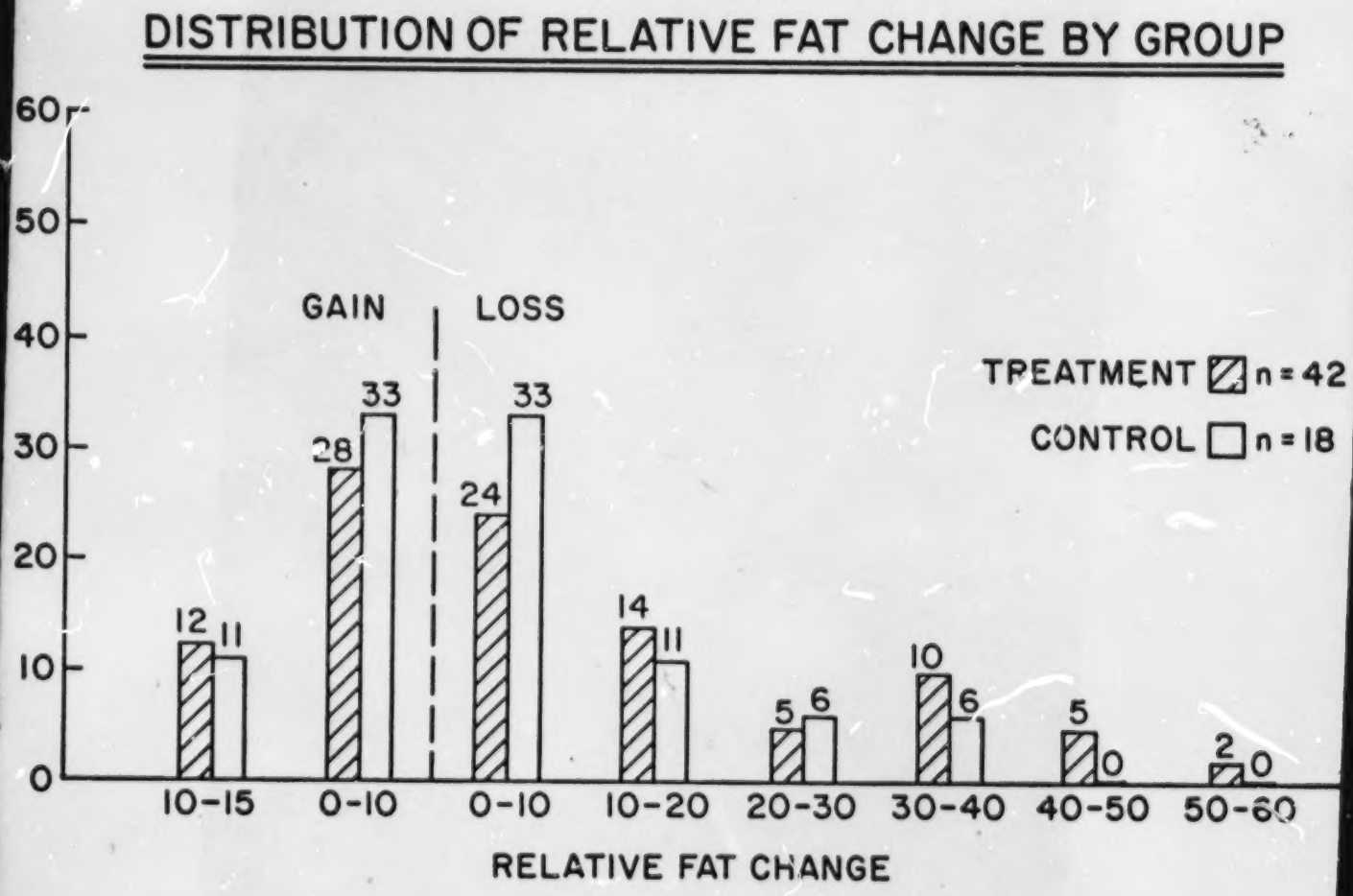

DISTRIBUTION OF WEIGHT CHANGE BY GROUP
60
50
40
30
20
10
GAIN
LOSS
TREATMENT n=44
CONTROL n=19
0
5
23
42
41
42
32
5
2
0
2
5
11-21
0-10
0-10
10-20
20-30
30-40
WEIGHT CHANGE (LBS.)

Figure 2


DISTRIBUTION OF RELATIVE FAT CHANGE BY GROUP
60
50
40
30
20
10
0
GAIN
LOSS
TREATMENT n = 42
CONTROL n = 18
12
11
28
33
24
33
14
11
5
6
10
6
5
0
2
0
10-15
0-10
0-10
10-20
20-30
30-40
40-50
50-60
RELATIVE FAT CHANGE

fat change in the minimal group was 14 percent compared to four percent in the maximal group, a difference which approached but did not achieve significance. In this particular case, using this manual and this treatment format, minimal contact subjects lost as much weight and more of their excess fat than subjects receiving a greater amount of therapeutic contact.

Third, comparison of assessment methods. How did our assessment of body fat compare with other methods utilized? Our skinfold calipering (using Durnin and Womersley's 1974 equation) slightly overestimated but was highly correlated with the most accurate method of assessing body fat available--underwater weighing. The correlation obtained was approximately .8, lending credence to the use of four site skinfold calipering in the assessment of body fat.

Four, Predictor variables. Because of its greater clinical utility, we correlated all premeasures with the outcome measure of relative fat change. Out of the clinically-practical variables, that is, out of those that are easily assessed by a clinician, four emerged as significant predictors of relative fat change as shown in Table 7:

Cognitive factors -- High scores on the Cognitive Factors Questionnaire (indicating good cognitive ecology) were positively correlated with excess fat lost; in other words, the better pre-cognitive ecology, the greater the fat loss;

Energy balance knowledge -- Interestingly, the greater energy balance knowledge, the lower the percent of excess fat loss. One speculation here which we plan to check out is that energy balance knowledge may be correlated with participation in previous programs, which has previously correlated negatively with treatment outcome.

Percent fat -- Contrary to the consensus of the behavioral treatment literature regarding body weight, initial percent fat (regardless of the method used to assess it) was negatively correlated with loss of excess fat. The fatter subjects were to begin with, the less fat they lost.

Wrist girth -- Wrist girth was positively correlated with amount of fat lost, that is, the larger the wrist girth, the greater the fat loss. Implications for body-frame hypotheses may be salient.

Some of you may be interested in knowing the predictive status of adipose cellularity measures, since this is the first behavioral treatment study to evaluate it. Neither cell size nor cell number predicted responsiveness to treatment--on any outcome measure--at six months or at one year.

Finally, a multiple regression analysis was performed using several predictor variables that are especially relevant to typical outpatient treatment, (for example, initial body weight, percent fat, and measures of psychological adjustment). Of all these variables, initial percent fat by calipering, energy balance knowledge, and cognitive factors accounted for a significant percentage of the variance--with the other variables analyzed not appreciably adding to the proportion of the variance accounted for.

Insert Table 7 here

DISCUSSION AND IMPLICATIONS

This project has implications for at least three areas: assessment, prediction of outcome, and treatment.

Assessment. Based on our data and our clinical experience with these

Table 7

INDIVIDUAL PREDICTION OF RELATIVE FAT CHANGE

VARIABLE	CORRELATION	n	PROBABILITY
COGNITIVE FACTORS	.41	42	.007
ENERGY BALANCE KNOWLEDGE	-.43	42	.005
PERCENT FAT	-.60	36	.001
WRIST GIRTH	.44	42	.004

MULTIPLE PREDICTION OF RELATIVE FAT CHANGE

SET OF VARIABLES	MULTIPLE CORRELATION (R)	ADJUSTED R^2
INITIAL PERCENT FAT ENERGY BALANCE KNOWLEDGE COGNITIVE FACTORS	.73	.48

subjects, the need for more comprehensive and individualized assessment--and particularly the possible use of body fat, as the primary criterion of obesity--deserve consideration.

Prediction. Given yet another replication of outcome variability in this study, the potential clinical utility of the predictor variables identified requires--and deserves--further empirical evaluation.

Treatment: effectiveness and implications. The question is--is problem-solving treatment efficacious? And the answer is--it depends. First, in terms of weight loss, it may depend on how it is applied. It is salient that this problem-solving approach is essentially a general model used in generating individual strategies rather than a strategy itself. Our data and our clinical impressions combined to suggest that the individualization provided by such a model was a powerful component in the pre post changes we observed. In other words, in weight loss terms, as a general therapeutic model, the approach may be very effective. It is our clinical hunch that our specific application of this model, however, was not. Given that we have now received several reports of mean weight losses of 20 pounds and more from individuals using this manual and this approach, we are wondering whether our concern about permanence led us to overemphasize comfortable, gradual behavior change and to underemphasize weight loss per se. This may reflect more on our application than in the model itself. We suspect that these emphases may be more relevant to maintenance than to loss. This is a hunch we plan to empirically pursue. With more emphasis on weight loss per se, and more stringent application to specific areas such as social support given Dr. Brownell's impressive data, (Brownell, Heckerman, Westlake, Hayes, & Monti, 1977), larger weight losses may well occur.

Second, it may depend on how we define success. As a group our subjects did not lose a large amount of weight--the criterion most often used to define success.

However, given the complexity of obesity and age-old problems in maintenance, there are many ways to define success as demonstrated in Table 8. With this specific application of a problem solving approach, subjects did demonstrate impressive behavioral and psychological changes--changes that are clinically relevant as well as statistically significant--and changes that are at least theoretically related to weight loss maintenance. Interestingly, at one year, when these changes were assessed, treatment subjects had maintained the losses they had achieved at the end of active treatment.

Insert Table 8 here

Conclusions must await our two-year data, and as always, future research. Based on our data thus far, however, to the extent that we value behavioral and psychological improvement and weight maintenance over time, a problem-solving approach appears to be a promising approach. Combining its apparent potential to produce behavior change and maintenance with specific loss-relevant revisions appears to us to be an exciting avenue to pursue.

Let me close by reminding you of Dr. Williams' observation of our obese subjects. Given the status of the field at the present time--it's a good thing we are persistent as well as foolish.

Table 8

Behavioral and Psychological Changes

Variable	Mean Difference	n	T	p
Eating Habits	10.09	44	7.48	0.000
Mean Daily Calorie Intake	-236.27	33	3.60	0.001
Mean Daily Activity	1.50	33	4.45	0.000
Mean Daily Total Nutrition Score	19.54	32	6.81	0.000
Cognitive Factors	20.14	44	5.67	0.000
Energy Balance Knowledge	6.45	44	5.35	0.000
Bech Depression Inventory	- 3.50	42	3.80	0.000
Taylor Manifest Anxiety Scale	- 4.32	40	3.88	0.000
Restraint Questionnaire	- 1.60	38	2.64	0.012

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